Post-Removal Action Report
for
Creosote Dip Tank Site
Naval Construction Battalion Center
Davisville, Rhode Island

Northern Division
Naval Facilities Engineering Command
Contract Number N62472-90-D-1298
Contract Task Order 0004

November 1993

Halliburton NUS CORPORATION

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POST-REMOVAL ACTION REPORT
FOR
CREOSOTE DIP TANK SITE
NAVAL CONSTRUCTION BATTALION CENTER
DAVISVILLE, RHODE ISLAND

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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1.0 INTRODUCTION

Halliburton NUS has performed: (1) investigative; (2) characterization; (3) removal action design; and (4) removal action monitoring work at the Cresote Dip Tank (Site) at the Naval Construction Battalion Center (NCBC) in Davisville, Rhode Island. This work was performed through CTO No. 0004 under the Comprehensive Long-Term Environmental Action Navy (CLEAN), Contract Number N62472-90-D-1298. The NCBC is scheduled to close in 1994.

The Creosote Dip Tank Site was contaminated with polynuclear aromatic hydrocarbons (PAHs) from operation of the creosote dip tank (Dip Tank). During the investigative phase of the project, samples were collected and analyzed to characterize the Site. After the Site was characterized, a removal action objective was identified, and design plans and specifications were prepared to achieve that objective. The design was implemented during the subsequent removal action phase. During and after the removal action, confirmatory samples were collected and analyzed to assess the effectiveness of the removal action. The confirmatory sampling analytical results indicate that, although traces of PAH contamination remain at the Site, the PAH contamination from the Dip Tank operation has been removed, and the removal action objective has been achieved. Calculations based on the results of the confirmatory analysis indicate that the total risk associated with the trace PAH contamination is within the range considered to be acceptable by the EPA under both the RCRA and CERCLA programs. Therefore, no further action is proposed for the Site.

The report presents brief background information, summarizes the removal action activities that were performed, and provided justification for no further action at the Site.

1.1 BACKGROUND INFORMATION

The Site is located on the northeast side of NCBC. The exact history of the area is unknown; however, discussions with NCBC personnel and observations provided some insight into the history of the area. Prior to 1942, the area may have been occupied by shacks or barracks for Naval personnel. Sometime around 1942, the personnel quarters were razed. Between approximately 1942 and 1974, the area was used as a training area for NCBC personnel. The training conducted in the area consisted generally of constructing various types of structures and facilities normally expected to be constructed in a wartime situation as well as providing an area for personnel to practice operating construction equipment.

Regarding the Site specifically, little is known of its precise history. Halliburton NUS became aware of the Site in 1991 after it was identified by NCBC personnel who noted a stainless steel tank (Dip Tank) lying upside down in a field located on the east side of Wescott Road. The Dip Tank was approximately 15 feet long by 9 feet wide by 4.5 feet deep. Upon righting the Dip Tank, NCBC personnel observed approximately 2 cubic yards of a residual material on the ground. Figure 1-1 illustrates the condition of the Site during the summer of 1992, prior to the removal action. As shown on Figure 1-1, the Site was generally flat. It was covered with wild grasses and contained some small trees and shrubs. Excavation at the Site during the removal action phase indicates that the area is backfilled with material that contains construction demolition debris.

During the investigative and characterization phases of the project, Halliburton NUS performed sampling and analysis of both the residual material and soils in the vicinity of the Dip Tank. Analysis was performed for volatile organics, semi-volatile organics, and metals. Analytical results indicated that both the residual material and soils were contaminated with PAHs. The residual material was approximately 14 percent PAHs, and the soils contained PAHs in varying amounts. The maximum concentrations of PAHs in the soils below the Dip Tank are shown on Table 1-1. Halliburton NUS prepared a removal action design package to remove residual soils, excavate contaminated soils, and clean the Dip Tank. Halliburton NUS then monitored implementation of the removal action.

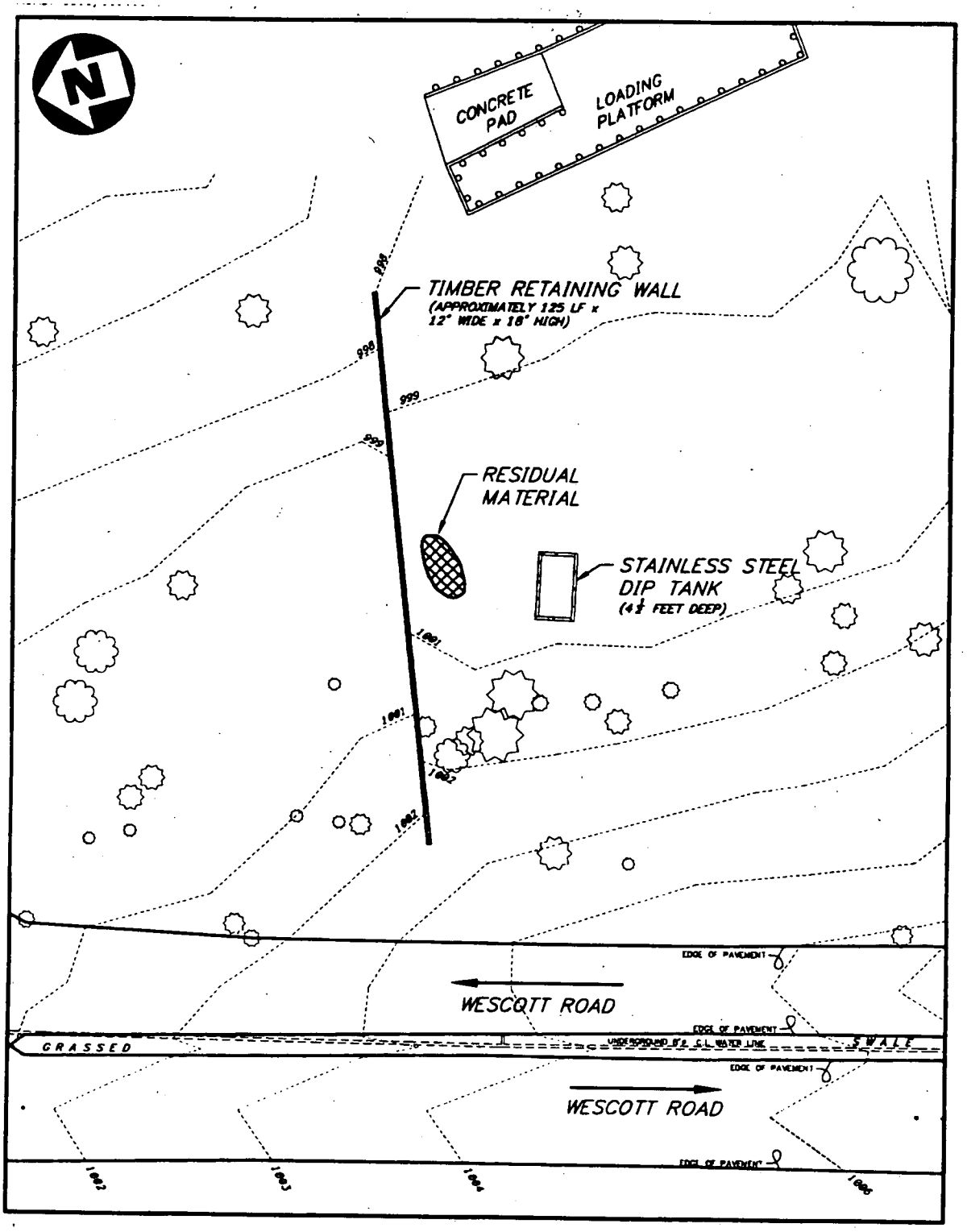
1.2 REMOVAL ACTION OBJECTIVE

During the characterization and design phases, Halliburton NUS developed a removal action objective for the project. The removal action objective was to remove PAH contamination so that the Site would not exceed a cumulative 10^{-4} cancer risk in accordance with current EPA guidance. In order to achieve the removal action objective, Halliburton NUS established site-specific action levels. These action levels were established by:

Reviewing analytical data from the Site.

- Developing Media Cleanup Standards (MCSs) for the analytes detected at the Site.

Establishing the MCSs as action levels for analytes detected at the Site at concentrations that exceed the MCSs.



PRE-REMOVAL ACTION CONDITIONS
CREOSOTE DIP TANK SITE
DAVISVILLE, RHODE ISLAND

0 30 60
SCALE IN FEET

FIGURE 1-1

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TABLE 1-1

PRE-EXCAVATION ANALYTICAL RESULTS AND PROJECT ACTION LEVEL/MCS SUMMARY
CREOSOTE DIP TANK SITE
NCBC DAVISVILLE, RHODE ISLAND

Analyte	Maximum Concentrations Detected in Contaminated Soil at the Site (mg/kg)	Original MCSs (or Project Action Levels) (mg/kg)
Acenaphthene	7.1	---
Acenaphthylene	14	---
Anthracene	550	---
Benzo(a)anthracene	130	0.41
Benzo(a)pyrene	25	0.061
Benzo(b)fluoranthene	85	0.44
Benzo(g,h,i)perylene	14	---
Benzo(k)fluoranthene	74	0.92
Chrysene	270	14
Dibenzo(a,h)anthracene	4.4	0.054
Dibenzofuran	13	---
Fluoranthene	870	---
Fluorene	130	---
Indeno(1,2,3-cd)pyrene	19	0.26
2-Methylnaphthalene	0.57 J	---
Naphthalene	0.35	---
Phenanthrene	460	---
Pyrene	650	---

Source: Removal Plan for NCBC, Davisville, Rhode Island; CLEAN Contract; Halliburton NUS; December 1991.

Analytical data from Site soil samples include volatile organics, semi-volatile organics (including PAHs), and metals. The PAH concentrations were identified to be the contaminants of concern. MCSs were established in accordance with proposed RCRA Subpart S regulations (EPA, July 27, 1990). MCSs were established for the PAH contaminants detected at the Site. Both residential- and industrial-type exposure scenarios were evaluated. However, because the future land use was unknown, the more conservative residential land use scenario was selected for establishment of action levels.

Project MCSs (as action levels) were established at an incremental 10^{-6} cancer risk. The action levels were established at that risk level to achieve the removal action objective of a cumulative incremental 10^{-4} cancer risk. The original MCSs were calculated by Halliburton NUS and presented in a Removal Plan in December 1991. (As discussed later in this report, risk criteria has changed since 1991 and, therefore, calculated MCSs were different at the end of the project.) The original MCSs were identified as project action levels within that plan and are presented in Table 1-1.

1.3 REPORT FORMAT

Section 1.0 of this report presents an introduction and background information. Section 2.0 discusses the proposed and actual removal action performed. Section 3.0 presents removal action objectives, and Section 4.0 presents a summary and conclusions.

2.0 REMOVAL ACTION

2.1 PROPOSED REMOVAL ACTION

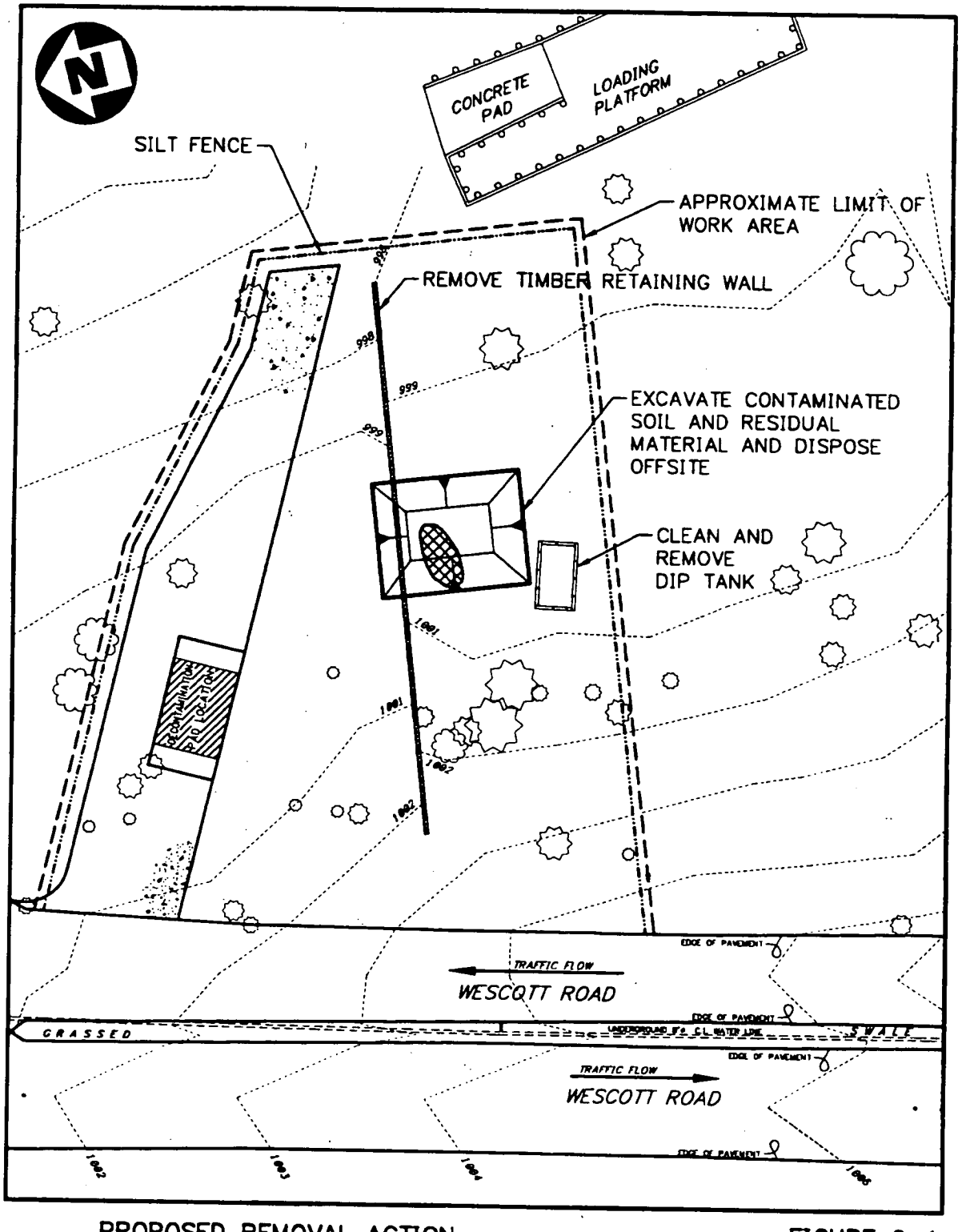
Halliburton NUS prepared a Removal Plan for the Site in December 1991 (Halliburton NUS 1991). Halliburton NUS then prepared plans and specifications for a construction contractor to implement that plan. The major tasks specified in the plans and specifications consisted of:

- Cleaning the stains and removing the residue from the Dip Tank and subsequent offsite disposal of the Dip Tank and residue.
- Removing the residual material on the ground and subsequent offsite disposal.
- Excavating and removing PAH-contaminated soil (to attain the removal action objective, i.e., cumulative incremental cancer risk below 10^{-4}) and subsequent offsite disposal.

The proposed site work for the removal action is shown on Figure 2-1. As shown on that figure, the removal action was to consist of (1) initial soil excavation, which was proposed to be a rectangular-shaped area approximately 20 feet by 32 feet by 8 feet deep; (2) cleaning and removing the Dip Tank; (3) removal of residual material; and (4) removal of the timber retaining wall. Confirmatory sampling was to be performed, and subsequent removal action was to be performed until the results of the confirmation analysis indicated that the removal action objective had been achieved.

The contaminated soil and residual material was classified as an FO34 waste (Halliburton NUS, 1991). The RCRA Regulations of 40 CFR 261.31 (hazardous waste from non-specific sources) define Industry and EPA Hazardous Waste No. FO34 as

> "Wastewaters, process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use creosote formulations. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving process that use creosote and or pentachlorophenol."



PROPOSED REMOVAL ACTION
CREOSOTE DIP TANK SITE
DAVISVILLE, RHODE ISLAND

FIGURE 2-1

HALLIBURTON NUS
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Appendix VII of Part 261 indicated that the waste was listed as hazardous because it contains benzo(a)anthracene, benzo(k)fluoranthene, benzo(a)pyrene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, naphthalene, arsenic, or chromium. As previously described, some of those compounds were detected in the samples collected from the site. Therefore, the material was classified as a Hazardous FO34 waste. According to the definition for FO34 waste and the preamble to the listing of FO34 waste, the contaminated material on the Site did not require pretreatment prior to disposal in a hazardous waste landfill. Therefore, the residual material and contaminated soil was proposed to be disposed of in a hazardous waste landfill.

2.2 REMOVAL ACTION PERFORMED

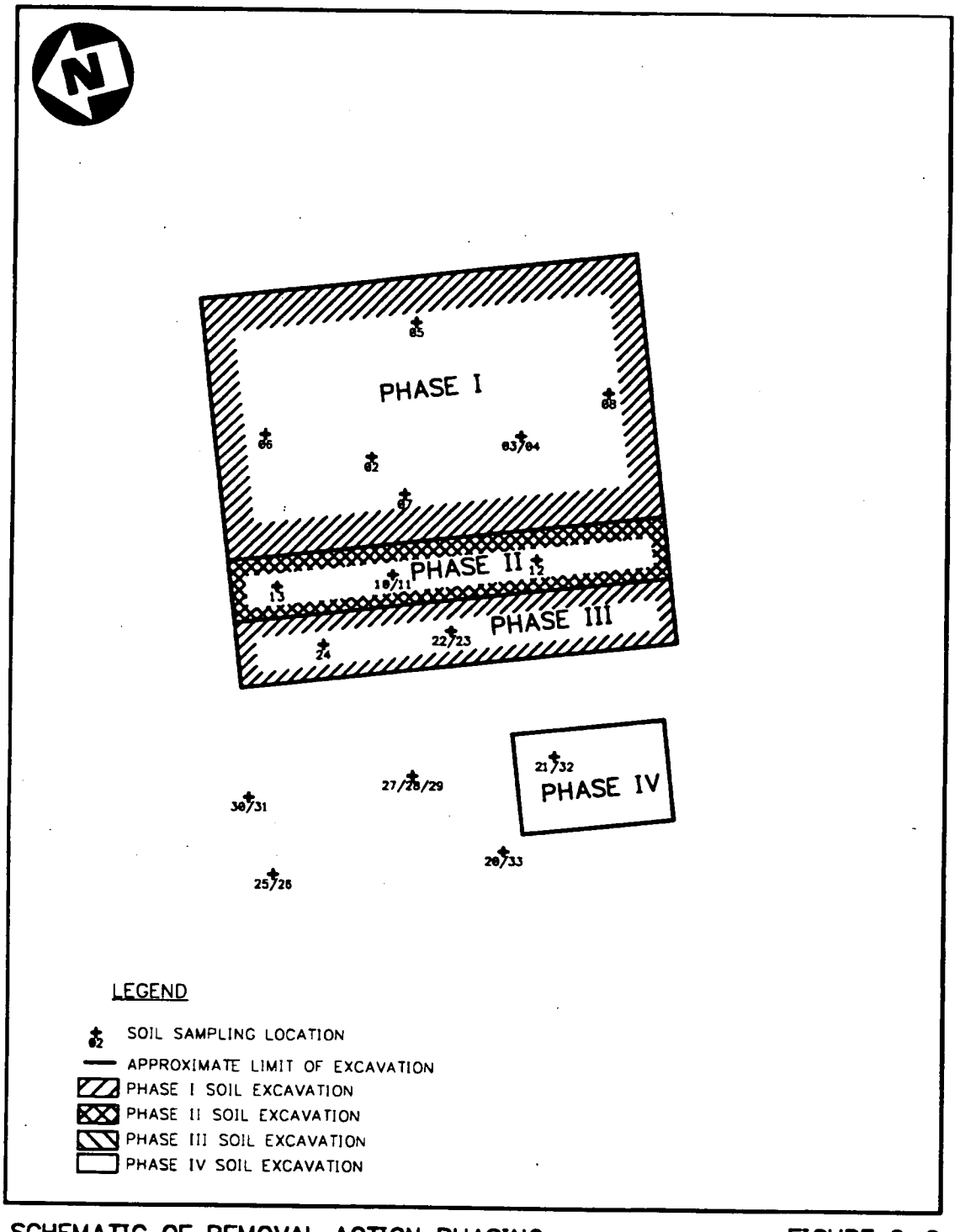
Removal action at the Site was performed under contract to the Navy by JDT Construction and their subcontractors. The removal action was performed through the following four phases:

Phase	Date Performed	Major Activities
I	Feb. 24, 25, & 26, 1993	Initial excavation of soil and residual material (both were stockpiled on site), cleaning of Dip Tank, and offsite disposal of Dip Tank.
II	March 23, 1993	Supplemental excavation of soil (on west side of excavation).
III	May 19, 1993	Supplemental excavation of soil (on west side of excavation) and offsite disposal of PAH-contaminated soils and residual material.
IV	September 28, 1993	Excavation and offsite disposal of PAH-contaminated soil from "hot spot" and subsequent backfill of all excavations.

Confirmatory sampling and analysis was performed after the first three phases. The results of the confirmation analysis were used to perform subsequent phases of excavation. The excavation phases are schematically illustrated on Figure 2-2.

2.2.1 Phase I Removal Action

Phase I removal action was performed on February 24, 25, and 26, 1993. Phase I included site preparation, cleaning the Dip Tank via sand blasting, initial excavation of contaminated soil, and temporarily stockpiling the contaminated soil and residual material on site. The railroad tie timber retaining wall was also removed and stockpiled on site.



SCHEMATIC OF REMOVAL ACTION PHASING
CREOSOTE DIP TANK SITE
DAVISVILLE, RHODE ISLAND

FIGURE 2-2

0 10 20
APPROXIMATE SCALE IN FEET

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2.2.1.1 Confirmatory Sampling and Analysis

Halliburton NUS collected seven soil samples (SS-02 through SS-08) from the initial excavation; one soil sample was collected from each side, and three samples (including one duplicate) were collected from the bottom of the excavation. The approximate locations of the sampling points are shown on Figure 2-2. Two wipe samples (plus one duplicate) were also collected from the inside of the "cleaned" Dip Tank. All samples were analyzed for PAHs. The analytical procedure used for the analysis was SW-846, Method 8310.

Results of the soil sample analysis are shown on Table 2-1. As shown on Table 2-1, detected contaminant concentrations in soil sample SS-07 (the sample from the west side of the excavation nearest Westcott Road) exceeded the action levels. Therefore, additional excavation (Phase II) was required.

PAHs were not detected in any of the wipe samples (the detection limit was 10 μg). Therefore, the Dip Tank was determined to be clean and was transported offsite for disposal.

2.2.2 Phase II Removal Action

Phase II removal action on March 23, 1993. Phase II activities consisted of excavating an additional area approximately 22 feet long and 6 feet wide on the south side of the Phase I excavation (where the elevated levels of PAHs were detected in Phase I). The excavation soil was temporarily stockpiled on site with the Phase I soil.

2.2.2.1 Confirmatory Sampling and Analysis

Three soil samples plus one duplicate (SS-10 through SS-13) were collected from the west side of the excavation after Phase II removal action. Validated analytical results of the Phase II confirmatory sampling and analysis are shown in Table 2-2. As shown in Table 2-2, the analytical results indicated that PAH concentrations in all three samples exceeded project action levels. Therefore, additional excavation (Phase III) was required.

TABLE 2-1

PHASE I ANALYTICAL RESULTS

CREOSOTE DIP TANK SITE
NCBC DAVISVILLE, RHODE ISLAND

Analyte	All concentrations in mg/kg							
	Original MCSs	SS-02	SS-03	SS-04	SS-05	SS-06	SS-07	SS-08
Acenaphthene	---	0.66 U	0.66 U	0.66 U	4 U	7.9 U	37	4 U
Acenaphthylene	---	0.66 U	0.66 U	0.66 U	4 U	7.9 U	11	4 U
Anthracene	---	0.049 J	0.045 J	0.034 J	0.3 J	7.9 U	140 J(q)	6.6
Benzo(a)anthracene	0.41	0.66 U	0.66 U	0.66 U	4 U	7.9 U	30	0.3 J
Benzo(a)pyrene	0.061	0.66 U	0.66 U	0.66 U	4 U	7.9 U	8.6	4 U
Benzo(b)fluoranthene	0.44	0.66 U	0.66 U	0.66 U	4 U	7.9 U	11	0.1 J
Benzo(g,h,i)perylene	---	0.66 U	0.66 U	0.66 U	4 U	7.9 U	8.8	4 U
Benzo(k)fluoranthene	0.92	0.66 U	0.66 U	0.66 U	4 U	7.9 U	11	0.1 J
Chrysene	14	0.023 J	0.66 U	0.66 U	4 U	7.9 U	26	0.4 J
Dibenz(a,h)anthracene	0.054	0.66 U	0.66 U	0.66 U	4 U	7.9 U	2.9 J	4 U
Fluoranthene	---	0.53 J	0.66 U	0.66 U	0.103 J	0.370 J	89	1.3 J
Fluorene	---	0.66 U	0.66 U	0.66 U	4 U	7.9 U	5.3 U	4 U
Indeno(1,2,3-cd)pyrene	0.26	0.66 U	0.66 U	0.66 U	4 U	7.9 U	8.1	4 U
Naphthalene	---	0.66 U	0.66 U	0.66 U	4 U	7.9 U	13	4 U
Phenanthrene	---	0.046 J	0.030 U	0.66 U	0.2 J	7.9 U	5.3 UR	3.1 J
Pyrene	---	0.038 J	0.66 U	0.66 U	0.095 J	0.28 J	33	0.9 J

U Undetected.
J Estimated (value below RDL).
J(q) Estimated (due to quantitation in interferences).
R Rejected (integration error: no data available).

NOTES:
1. SS-03 and SS-04 are field duplicates.
2. Shaded numbers indicate concentrations that exceed original MCSs.

TABLE 2-2

PHASE II ANALYTICAL RESULTS

CREOSOTE DIP TANK SITE
NCBC DAVISVILLE, RHODE ISLAND

Analyte	All concentrations in mg/kg				
	Original MCSs	SS-10	SS-11	SS-12	SS-13
Acenaphthene	---	17	33	3.1 U	2.4 U
Acenaphthylene	---	7.7	19 U	0.330	3 U
Anthracene	---	38	150	2	16
Benzo(a)anthracene	0.41	7.3 J	8.0 J	1.1 J	1.7 J
Benzo(a)pyrene	0.061	3.2 J	3.7 J	0.52 J	1 J
Benzo(b)fluoranthene	0.44	6.1 J	5.4 J	0.93 J	2 J
Benzo(g,h,i)perylene	---	1.2 J	19 U	0.29 J	0.43 J
Benzo(k)fluoranthene	0.92	2.5 J	3.5 J	0.38 J	1.1 J
Chrysene	14	7.2 U	12 J	1.1 J	2 J
Dibenz(a,h)anthracene	0.054	7.7 U	19 U	1.9 U	3 U
Dibenzofuran	---	18	39	2.1	4
Fluoranthene	---	25	39	3.6	4.1
Fluorene	---	23	60	2.6	7.7
Indeno(1,2,3-cd)pyrene	0.26	1.4 J	19 U	0.27 J	0.45 J
2-Methylnaphthalene	---	11	28	1.9 J	2 J
Naphthalene	---	3 J	12 J	1 J	0.680 J
Phenanthrene	---	40	110	5.8	9.7
Pyrene	---	25 J(c)	30	3.9 J(c)	5.1 J(c)

U Undetected.
J Estimated (value below RDC).
J(c) Positive result qualified as estimate as a result of continuous calibration percent Ds >25 percent.

NOTES:
1. SS-10 and SS-11 are field duplicates.
2. Shaded numbers indicate concentration that exceed original MCSs.

2.2.3 Phase III Removal Action

Phase III removal action was performed on May 19, 1993. Phase III consisted of excavating additional soil from the west side of the excavation and transportation and disposal of all excavated soil (from Phases I, II, and III) and subsequent offsite disposal at the permitted Wayne Disposal, Inc., landfill facility in Belleville, Michigan. As part of Phase III, Halliburton NUS performed confirmatory sampling and analysis to assess contamination on the west side of the excavation and supplemental sampling and analysis to determine the extent of contamination beyond the west side of the excavation.

2.2.3.1 Confirmatory Sampling and Analysis

Two soil samples (SS-22 and SS-24) plus one duplicate (SS-23) were collected from the west side after Phase III excavation. As shown on Table 2-3, the PAH concentrations of four compounds slightly exceed (within one order of magnitude) the project action levels (MCSs) for the SS-22/SS-23 sample. The concentration of one PAH compound [benzo(a)pyrene] in sample SS-24 exceeded the project action level (MCSs). These concentrations are two orders of magnitude below the levels originally detected in the soil and one order of magnitude less than the levels detected in previous confirmatory analysis.

2.2.3.2 Supplemental Samples and Analysis

Ten soil samples plus one duplicate were collected from the area beyond the west side of the excavation. The approximate sampling locations and depths are shown on Figure 2-2 and Table 2-4, respectively. As shown on Table 2-4, five shallow and five deep (plus one duplicate) supplemental soil samples were collected. Analytical results of the supplemental samples are summarized on Table 2-3. As shown on Table 2-3, three of the five surface soil samples did not contain PAH compounds above project action levels (MCSs). The other two surface samples and four of the five deep samples typically contained only one PAH compound [benzo(a)pyrene] at concentrations slightly above (within one order of magnitude) project action levels (MCSs). As shown on Table 2-3, one deep sample (SS-32) has concentrations of six PAH compounds that exceed project action levels (MCSs); however, no PAH contamination was detected in the surface sample (SS-20) obtained directly above SS-32. This one deep sample was used to identify a "hot spot" of PAH contamination.

TABLE 2-3

PHASE III ANALYTICAL RESULTS

CREOSOTE DIP TANK SITE
NCBC DAVISVILLE, RHODE ISLAND

Analyte	All concentrations in mg/kg														
	Original MCSs (or Project Action Levels)	Confirmatory Analysis			Supplemental Analysis										
		SS-22	SS-23	SS-24	Surface SS-20	Surface SS-21	Surface SS-25	Deep SS-26	Surface SS-27	Deep SS-28	Deep SS-29	Surface SS-30	Deep SS-31	Deep SS-32	Deep SS-33
Acenaphthene	—	0.66 J	0.55 J	0.59 J	0.35 U	0.35 U	0.36 U	0.40 U	0.35 U	0.39 U	0.38 U	0.37 U	0.37 U	73.0 U	0.35 U
Acenaphthylene	—	1.5 U	1.5 U	1.5 U	0.35 U	0.35 U	0.36 U	0.40 U	0.35 U	0.39 U	0.38 U	0.37 U	0.37 U	73.0 U	0.35 U
Anthracene	—	2.9	3.3	10.0	0.35 U	0.35 U	0.39	0.39 J	0.35 U	0.39 U	0.38 U	0.32 J	0.37 U	16.0 J	0.35 U
Benzo(a)anthracene	0.41	1.3 J	1.4 J	0.36 J	0.35 U	0.35 U	0.12 J	0.34 J	0.071 J	0.087 J	0.051 J	0.19 J	0.11 J	180.0	0.14 J
Benzo(a)pyrene	0.061	0.64 J	0.80 J	0.15 J	0.35 U	0.35 U	0.11 J	0.41	0.046 J	0.083 J	0.38 U	0.13 J	0.10 J	160.0	0.14 J
Benzo(b)fluoranthene	0.44	1.4 J	1.5	0.25 J	0.35 U	0.35 U	0.23 J	0.65	0.069 J	0.14 J	0.073 J	0.30 J	0.14 J	230.0	0.22 J
Benzo(g,h,i)perylene	—	1.5 U	1.5 U	1.5 U	0.35 U	0.35 U	0.36 U	0.28 J	0.35 U	0.39 U	0.38 U	0.37 U	0.054 J	49.0 J	0.35 U
Benzo(k)fluoranthene	0.92	0.54 J	0.56 J	0.19 J	0.35 U	0.35 U	0.052 J	0.21 J	0.35 U	0.051 J	0.38 U	0.077 J	0.072 J	68.0 J	0.061 J
Chrysene	14	1.4 J	1.8	0.38 J	0.35 U	0.35 U	0.24 J	0.59	0.052 J	0.11 J	0.043 J	0.35 J	0.11 J	150.0	0.12 J
Dibenzo(a,h)anthracene	0.054	1.5 U	1.5 U	1.5 U	0.35 U	0.35 U	0.36 U	0.40 U	0.35 U	0.39 U	0.38 U	0.37 U	0.37 U	73.0 U	0.35 U
Dibenzofuran	—	0.73 J	0.56 J	1.4 J	0.35 U	0.35 U	0.36 U	0.40 U	0.35 U	0.39 U	0.38 U	0.37 U	0.37 U	73.0 U	0.35 U
Fluoranthene	—	3.7	3.9	1.2 J	0.35 U	0.35 U	0.46	0.88	0.090 J	0.14 J	0.071 J	0.69	0.14 J	270.0	0.23 J
Fluorene	—	0.87 J	0.85 J	4.0	0.35 U	0.35 U	0.36 U	0.40 U	0.35 U	0.39 U	0.38 U	0.37 U	0.37 U	73.0 U	0.35 U
Indeno(1,2,3-cd)pyrene	0.26	1.5 U	0.44 J	1.5 U	0.35 U	0.35 U	0.36 U	0.32 J	0.35 U	0.39 U	0.38 U	0.37 U	0.063 J	69.0 J	0.35 U
2-Methylnaphthalene	—	1.5 U	1.5 U	0.62 J	0.35 U	0.35 U	0.36 U	0.40 U	0.35 U	0.39 U	0.38 U	0.37 U	0.37 U	73.0 U	0.35 U
Naphthalene	—	1.5 U	1.5 U	0.19 J	0.35 U	0.35 U	0.36 U	0.40 U	0.35 U	0.39 U	0.38 U	0.37 U	0.37 U	73.0 U	0.35 U
Phenanthrene	—	3.1	2.7	5.4	0.35 U	0.35 U	0.27 J	0.42	0.35 U	0.088 J	0.38 U	0.37	0.053 J	35.0 J	0.075 J
Pyrene	—	5.4	4.6	1.1 J	0.35 U	0.35 U	0.39	1.1	0.075 J	0.17 J	0.065 J	0.60	0.11 J	280.0	0.22 J

U Undetected.
J Estimated (value below RDC).

NOTES:

1. SS-22, SS-23, SS-28, and SS-29 are field duplicates.
2. Shaded numbers indicate concentration that exceeds MCSs.

TABLE 2-4

PHASE III SAMPLING LOCATION SUMMARY
CREOSOTE DIP TANK SITE
NCBC DAVISVILLE, RHODE ISLAND

Type of Sample	Sample Number	Approximate Depth Below Ground Surface	Comments
Confirmatory	SS-22	~3' - 4'	Duplicate of SS-23 - sidewall of Phase III excavation
	SS-23	~3' - 4'	Duplicate of SS-22 - sidewall of Phase III excavation
	SS-24	~3' - 4'	Sidewall of Phase III excavation
Supplemental	SS-20	0" - 12"	Deep sample from this location is SS-33
	SS-21	0" - 12"	Deep sample from this location is SS-32
	SS-25	0" - 12"	Shallow
	SS-26	31" - 39"	Deep
	SS-27	0" - 12"	Shallow
	SS-28	30" - 44"	Deep (duplicate of SS-29)
	SS-29	30" - 44"	Deep (duplicate of SS-28)
	SS-30	0" - 12"	Shallow
	SS-31	23" - 27"	Deep (refusal)
	SS-32	29" - 40"	Matrix Spike (double volume)
	SS-33	30" - 32"	(refusal)

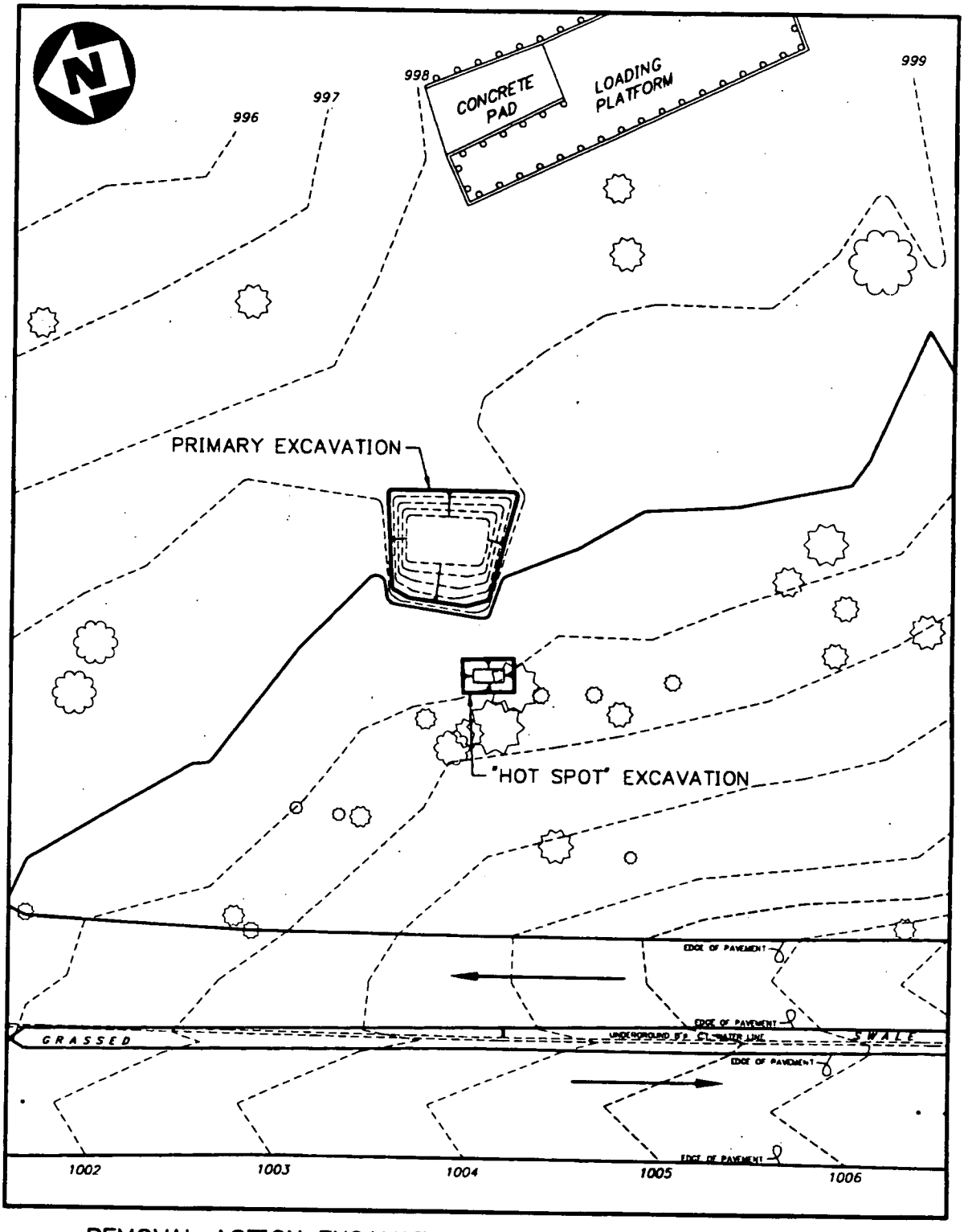
2.2.4 Phase IV Rem val Action

Phase IV removal action consisted of excavating the "hot spot" at Phase III sampling location SS-32, backfilling all excavations and regrading the disturbed area. Approximately 6 cubic yards of contaminated soil was excavated from the "hot spot" area of sampling location SS-32; the excavated material was transported off site for disposal at the Wayne Disposal, Inc., landfill facility in Belleville, Michigan. The extent of the onsite excavations are shown on Figure 2-3. All excavations were backfilled with sandy material obtained from Richmond Sand and Gravel, Inc., in Richmond, Rhode Island. The entire disturbed area was regraded as shown on Figure 2-4. No confirmatory sampling and analysis was performed after Phase IV.

2.3 REMOVAL ACTION SUMMARY

Soil excavation was performed in four phases. Phases II, II, and IV soil excavation was based on the confirmatory sampling and analysis of the previous phase.

After Phase IV excavation, there was (and is) some PAH contamination at the Site. The remaining PAH contamination includes trace PAH contamination on the west side of the excavation slightly above original project action levels. However, this remaining trace PAH contamination does not appear to be from operation of the Dip Tank, and it does not present an unacceptable risk in accordance with RCRA and CERCLA requirements. The "hot spot" beyond the west side of the excavation did not appear to be from the Dip Tank operation but was excavated as part of this project to remove an identified "hot spot" of contamination.

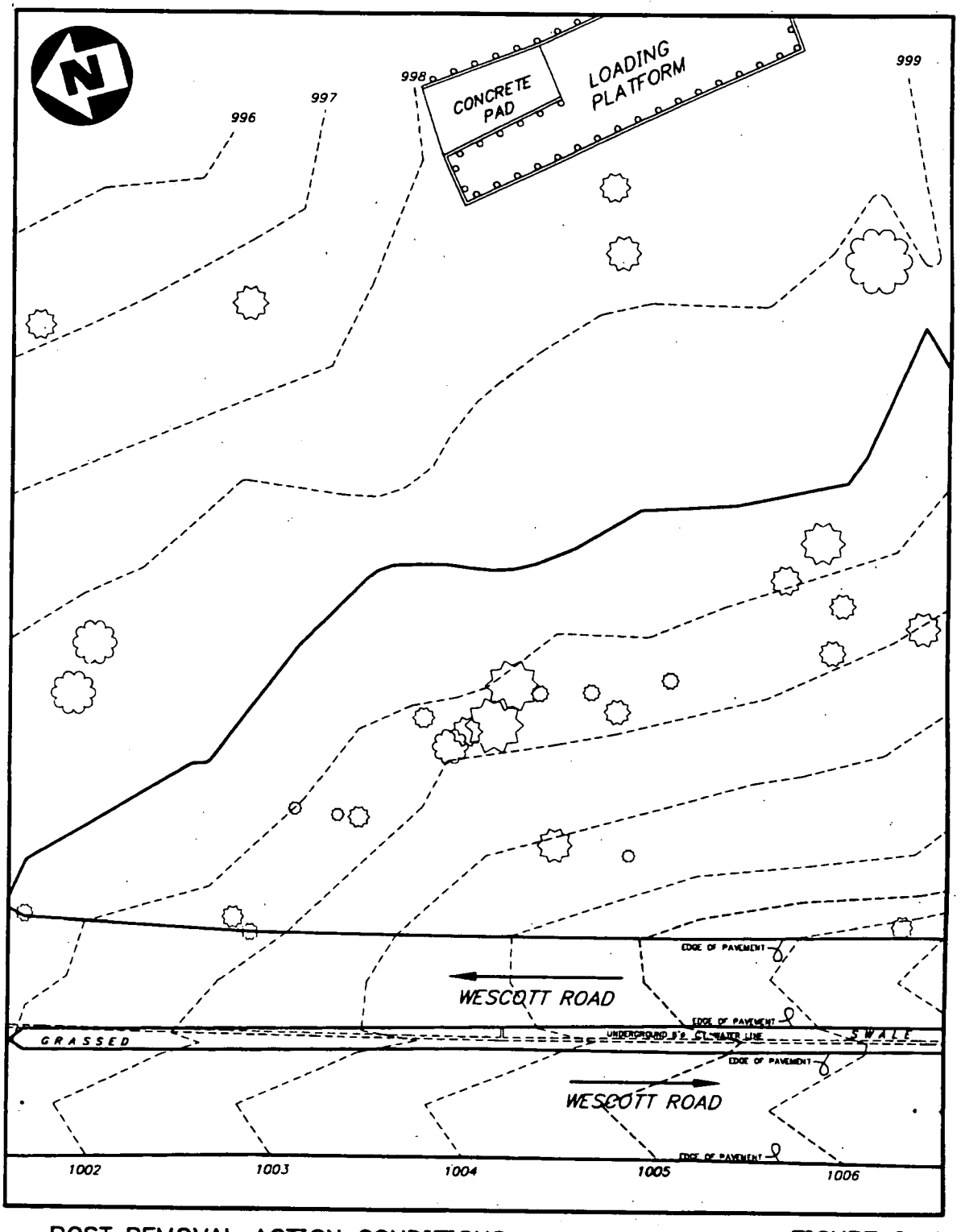


REMOVAL ACTION EXCAVATION
CREOSOTE DIP TANK SITE
DAVISVILLE, RHODE ISLAND

0 30 60
SCALE IN FEET

FIGURE 2-3

HALLIBURTON NUS
Environmental Corporation



POST REMOVAL ACTION CONDITIONS
CREOSOTE DIP TANK SITE
DAVISVILLE, RHODE ISLAND

0 30 60
SCALE IN FEET

FIGURE 2-4

HALLIBURTON NUS
Environmental Corporation

3.0 REMOVAL ACTION OBJECTIVE

3.1 ESTABLISHMENT OF REMOVAL ACTION OBJECTIVE

The removal action objective for this project was to remove PAH contamination to attain a cumulative 10^{-4} cancer risk under a conservative residential land use scenario. Although residential use of the property is not anticipated in the future, use of the residential scenario ensures protection of human health under all conditions. PAH-specific Media Cleanup Standards (MCSs) were calculated to achieve the removal action objective. These MCSs were calculated based on a residential land use scenario and a target cancer risk of 10^{-6} for individual contaminants to ensure attainment of a cumulative risk below 10^{-4}.

3.2 RESIDUAL RISK

Four phases of removal action work have been performed, and contaminants in some soils in the vicinity of the Dip Tank still exceed individual MCSs. However, evaluation of the residual risk associated with multiple PAHs contamination indicates that the residual risks are well within the EPA target risk range of 10^{-6} to 10^{-4}, and, therefore, the removal action objective has been achieved.

Risk calculations based on the results of the Phase III confirmatory analysis indicate that although individual compound concentrations result in theoretical incremental risks greater than 1 in a million (10^{-6}), the total risk is within the acceptable range (i.e., less than 1 in 10,000 or 10^{-4}).

Calculation of residual risk is based on ingestion of 100 mg of soil per day by an adult receptor over a 70-year lifetime.

The calculations as performed varied slightly from those initially presented for the determination of the MCSs. The initial calculation of the MCSs was based on a Cancer Slope Factor (CSF) of 11.5 kg-day/mg for benzo(a)pyrene, which has since been changed by the EPA to 7.3 kg-day/mg. All other PAHs are assigned a CSF based on relative toxicity factors (relative to benzo(a)pyrene). Therefore, the CSFs for all other carcinogenic PAHs also changed, and the subsequent MCSs also changed. The revised MCSs (along with

the original MCSs) are shown in Table 3-1. The equation used to determine MCSs for individual PAHs is as follows:

$$MCS\ (mg/kg) = \frac{10^{-6} * 70\ yr * 70\ kg}{CSF\ kg\text{-}day/mg * 0.1\ g/day * 0.001\ kg/g * 70\ yr}$$

$$MSC\ (mg/kg) = \frac{0.70}{CSF}$$

The parameters listed in the preceding equation include the target risk (10^{-6}), the receptor lifetime (70 years), the receptor body weight (70 Kg), the CSF, the ingestion rate (0.1 g per day), a conversion factor, and the exposure duration (70 years).

Table 3-1 indicates that, while some individual chemicals remain on site at concentrations that result in risks greater than 1×10^{-6} (i.e., concentrations exceed the MCSs), the total residual risk is less than 10^{-4} (1.3×10^{-5}). This risk, which corresponds to a 1-in-77,000 chance that a receptor will develop cancer, is based on a lifetime of exposure in a residential setting. No single chemical presents a risk of 10^{-5} or more. Given the conservative nature of the MCS scenario and the low risks associated with that scenario, the residual risks are considered to be acceptable, that is, within the EPA target risk range of 10^{-4} to 10^{-6}.

TABLE 3-1

RESIDUAL RISK CALCULATIONS
CREOSOTE DIP TANK SITE
NCBC DAVISVILLE, RHODE ISLAND

Analyte	All concentration in mg/kg			Residual Risk
	Original MCS (Project Action Level)	Revised MCS[1]	Maximum Trace (Residual) Contamination Remaining On Site	
Benzo(a)anthracene	0.41	0.66	1.4 J	2×10^{-6}
Benzo(a)pyrene	0.061	0.096	0.80 J	8×10^{-6}
Benzo(b)fluoranthene	0.44	0.68	1.5	2×10^{-6}
Benzo(k)fluoranthene	0.92	1.45	0.56 J	4×10^{-7}
Chrysene	14	21.8	1.8	8×10^{-8}
Dibenzo(a,h)anthracene	0.054	0.086	1.5 U	--
Indeno(1,2,3-cd)pyrene	0.26	0.41	0.44 J	1×10^{-6}
TOTAL	--	--	--	1.3×10^{-5}

(1) Revised based on revised Cancer Slope Factors (CSF)
MCS Media Cleanup Standards

J Estimated (value below RDC)
U Undetected

4.0 SUMMARY AND CONCLUSIONS

Based on field observations, the area in and around the Dip Tank appears to consist of random backfill material that contains miscellaneous debris including pieces of timbers, these timbers may contain residual creosote contamination. Sampling and analysis indicate that the area has random PAH contamination throughout. This remaining contamination appears to be the result of backfilling and not the Dip Tank operation; PAH contamination from the Dip Tank operation has been removed. The random PAH contamination remaining in the vicinity of the Site therefore is considered not to be associated with the Dip Tank.

The remaining contamination in soils in the vicinity of the Dip Tank does not present an unacceptable residual risk and the removal action objective has been achieved. The remaining residual risk of 1.3×10^{-5} is within the acceptable range in accordance with current EPA guidance. The project action levels calculated for individual compounds at the Site were Media Cleanup Standards (MCSs) developed in accordance with proposed Subpart S guidance. Although the specific MCSs were not achieved, the overall removal action objective was attained. The random PAH contamination remaining in the vicinity is within both the acceptable total risk range and is considered not to be associated with the Dip Tank. Therefore, no further action is appropriate for the Site.

REFERENCES

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Halliburton NUS, June 1992b. Post-Removal Verification Sampling and Analysis Plan, Comprehensive Long-Term Environmental Action Navy (CLEAN) Program, Creosote Spill Area, Naval Construction Battalion Center. Davisville, Rhode Island.